

REMARKS

The above amendments to the above-captioned application along with the following remarks are being submitted as a full and complete response to the Office Action dated December 4, 2003 (U.S. Patent Office Paper No. 11252003). In view of the above amendments and the following remarks, the Examiner is respectfully requested to give due reconsideration to this application, to indicate the allowability of the claims, and to pass this case to issue.

Status of the Claims

As outlined above, claim 12 is being canceled without prejudice or disclaimer, while claims 2 to 5 and 10 are being amended to correct formal errors and to more particularly point out and distinctly claim the subject invention. Support for the amendments to claims 2 to 5 and 10 can be found in the Specification, at least on pages 13 and 14. Applicants hereby submit that no new matter is being introduced into the application through the submission of this response.

Prior Art Rejections

Claims 2, 3, 4, and 13 are rejected under 35 U.S.C. §103(a) as being unpatentable over Fathy *et al.*, U.S. Patent No. 6,320,547 (further, Fathy '547) in view of Koriyama *et al.*, U.S. Patent No. 6,188,368 (further, Koriyama '368).

Applicants respectfully traverse the rejection and submit that amended claim 2 recites a high frequency circuit module, wherein RF circuit parts are mounted on both sides of a multilayer dielectric substrate, transmission lines connecting said RF circuit parts on both sides are constructed by a group of vias having a periodical structure or vias having a coaxial structure extended in a direction perpendicular to the face of said multilayer dielectric substrate, a plurality of grounding conductive layers provided in said multilayer dielectric substrate, and said group of vias having the periodical structure is constructed so that a plurality of vias are distributed around a center conductor at an interval which is equal to or smaller than 1/4 of wavelength of a signal of said transmission line, and end portions of said vias are connected with one of grounding conductive layers forming a microstrip transmission line and the one of grounding conductive layer has a circular radial gap being smaller than $\frac{1}{4}$

of the wavelength of a high frequency signal transmitted through the transmission line between an inner land connected to said center conductor and said grounding conductive layer.

An important feature of the present invention relates to the structure of the end portion of group of vias or coaxial line. The end portion of the group of vias or coaxial line is connected with the grounding conductive layer forming a microstrip transmission line. The grounding conductive layer forming a microstrip transmission line has circular radial gaps (or a land less pattern) smaller than $\frac{1}{4}$ of the wavelength of a high frequency signal transmitted through the transmission line between a inner land connected to said center conductor and said grounding conductive layer. The line, the dielectric substrate and the grounding layer form a microstrip line. The above-described coaxial structure forms a line that has low transmission losses. The above structure can also pertain to a microstrip transmission line and a transmission line having a coaxial structure connected effectively, without transmission losses. Further description about the above referenced features can be found in Applicant's disclosure, in connection with Figs. 2A, 2B, 3A, 3B, and 3C. This significant feature of the present invention is recited in now amended claim 2 as "end portions of said vias are connected with one of grounding conductive layers forming a microstrip transmission line and the one of grounding conductive layer has a circular radial gap being smaller than $\frac{1}{4}$ of the wavelength of a high frequency signal transmitted through the transmission line between an inner land connected to said center conductor and said grounding conductive layer."

The Examiner alleged in the Office Action, on page 2, that Fathy '547 teaches the high frequency circuit module of claim 2 and makes reference to the disclosure of FIGs. 5, 7, and 8 and col. 8, line 48 through col. 11, line 61 to support his allegation.

However, the Examiner conceded that Fathy '547 does not disclose at least a feature of the present invention, namely "the group of vias having the periodical structure is constructed so that a plurality of vias are distributed around a center at an interval which is equal to or smaller than $\frac{1}{4}$ of wavelength of a signal of said transmission line."

The Examiner alleged in the office action on page 3 that Koriyama '368 cures the deficiency of Fathy '547 with what is taught in Fig. 3 and that it would have been obvious to modify in Fathy '547 view of Koriyama '368 to obtain the recitation of claims 2, 3, 4 and 13. Applicants respectfully disagree with both allegations made above and submit that Koriyama '368 merely discloses a plurality of via conductors which are electrically connected to a

ground layer so as to surround a slot and a desired gap among the plurality of via conductors is not larger than $\frac{1}{4}$ the wavelength of high frequency signals. (See col. 3, lines 35-62)

After careful review of the reference, Applicants submit that Koriyama '368 at most, discloses details about the arrangement of vias relative to each other or to a dielectric layer, but does not disclose, teach or suggest how the end portion of the vias are connected nor that they are forming a microstrip line nor the advantages of such an arrangement.

In addition, Applicants respectfully submit that the combination of Fathy '547 and Koriyama '368 suggested by the Examiner would at most result in a high frequency circuit module that exhibits all the deficiencies described above, and would not disclose, teach or suggest each and every feature of the present invention.

Amended claim 3 recites a high frequency circuit module comprising a multilayer dielectric substrate having a first and a second dielectric substrates each of which has RF circuit parts mounted on one side thereof, and at least one third dielectric substrate provided between the first and second dielectric substrates, and a transmission line constructed by a via having a coaxial structure connecting said RF circuit parts of the first and second dielectric substrates in a direction perpendicular to the face of said multilayer dielectric substrate, wherein said via having a coaxial structure is formed by a center conductor and a cylindrical conductor surrounding said center conductor and connected to a plurality of grounding conductive layers provided in said multilayer dielectric substrate, grounding conductive layers is connected to both sides of the cylindrical conductor and has a circular radial gap from an inner land connected to said center conductor, and said circular radial gaps being smaller than $\frac{1}{4}$ of a wavelength of a high frequency signal to be transmitted through the transmission line between a inner land connected to said center conductor and said grounding conductive layers connected to both sides of the cylindrical conductor.

Applicants respectfully submit that the recitation of claim 2 and the recitation of claim 3 share the same features with the exception that claim 3 refers to the embodiment of a high frequency circuit module that comprises, instead of "a multilayer dielectric substrate" as recited in claim 2, "a first and second dielectric substrate" each having RF circuit parts mounted on one side thereof and at least a third dielectric substrate provided between the first and second dielectric substrate.

Therefore, Applicants respectfully contend that the same arguments presented above in response to the rejection of claim 2 apply in response to the rejection of claim 3.

Claims 4 and 13 depend from and add features to allowable claim 3. Therefore, they are also allowable for at least the same reasons discussed above in connection to claim 3.

Claims 10 and 12 are rejected under 35 U.S.C. §103(a) as being unpatentable over Sekine *et al.*, U.S. Patent No. 6,249,242 (further, Sekine '242) in view of Fathy *et al.*, U.S. Patent No. 6,320,547 (further, Fathy '547).

Amended claim 10 recites an automotive radar module, wherein an antenna metallic pattern is formed on one of faces of a multilayer dielectric substrate, RF circuit parts including an oscillation circuit, a power amplifier for amplifying a part of an output of said oscillation circuit and supplying the amplified output to said antenna, and a mixer for mixing a signal from said antenna metallic pattern with a signal of the oscillation circuit are formed on the other face of said multilayer dielectric substrate, and a transmission line for connecting said antenna metallic pattern and said RF circuit parts is constructed by a coaxial structure transmission line having a center conductor and a cylindrical conductor or a group of vias surrounding said center conductor provided in the direction perpendicular to faces of said multilayer dielectric substrate, and an end portion of said coaxial structure transmission line is connected with one of grounding conductive layer forming microstrip transmission line and connected with one of grounding conductive layer forming microstrip transmission line and having a circular radial gaps being smaller than 1/4 of the wavelength of high frequency signal be transmitted through the transmission line between said center conductor and said grounding conductive layer forming microstripline.

The Examiner alleged in the Office Action, on pages 3 and 4, that Sekine '242 teaches an automotive radar module with RF circuit arrangement. The Examiner cites Fig. 16A and its description from Sekine '242 to support his allegation. However, the Examiner concedes that Sekine '242 does not disclose at least a group of vias including a periodical structure or via having a coaxial structure provided in the direction perpendicular to the faces of the dielectric substrates.

Applicants respectfully submit that in addition to the deficiency cited above by the Examiner, Sekine '242 also fails to disclose, teach or suggest "an end portion of said coaxial structure transmission line is connected with one of grounding conductive layer forming microstrip transmission line is connected with one of grounding conductive layer forming microstrip transmission line and having a circular radial gaps being smaller than 1/4 of the

wavelength of high frequency signal be transmitted through the transmission line between said center conductor and said grounding conductive layer forming microstripline".

The Examiner further alleged in the office action, on page 4, that Fathy '547 cures the disclosure of Sekine '242 with what is taught in Fig. 7A, 7B and 8 and that it would have been obvious to modify in Sekine '242 in view of Fathy '547 to obtain the recitation of claim 10. Applicants respectfully disagree with both allegations made above.

Applicants discussed Fathy '547 and its disclosure above, in response to the rejection of claim 2. Therefore, Applicants respectfully submit that both Sekine '242 by itself and the combination of Sekine '242 and Fathy '547 fail to disclose, teach or suggest each and every feature of claim 10. These references cannot anticipate or render obvious the invention, as recited in amended claim 10.

Claim 12 has been canceled without prejudice. Therefore, the rejection against claim 12 is rendered moot.

Claims 2, 3, 4, 8, and 11 are rejected under 35 U.S.C. §103(a) as being unpatentable over Sekine *et al.*, U.S. Patent No. 6,249,242 (further, Sekine '242) in view of Fathy *et al.*, U.S. Patent No. 6,320,547 (further, Fathy '547) in view of Koriyama *et al.*, U.S. Patent No. 6,188,368 (further, Koriyama '368).

In response to the above rejection, Applicants submit that it has been found and shown above that none of the references cited by the Examiner in support of this last rejection disclose or suggest all the features of the present invention, either by themselves or in combination. Therefore, the present invention as claimed would not have been obvious in view of the combination of Sekine '242, Fathy '547, and Koriyama '368.

Allowable Subject Matter

Applicants gratefully acknowledge the allowability of claims 5 and 6 and respectfully submit that in view of the arguments presented above, the claims depend from allowable base claims. Therefore, the claims have not been rewritten in independent form. Applicants respectfully ask the Examiner to withdraw the rejection of the base claims and correspondingly claims 5 and 6.

Conclusion

In view of all the above, Applicants respectfully submit that certain clear and distinct differences as discussed exist between the present invention as now claimed and the prior art references upon which the rejections in the Office Action rely. These differences are more than sufficient that the present invention as now claimed would not have been anticipated nor rendered obvious given the prior art. Rather, the present invention as a whole is distinguishable, and thereby allowable over the prior art.

Favorable reconsideration of this application as amended is respectfully solicited. Should there be any outstanding issues requiring discussion that would further the prosecution and allowance of the above-captioned application, the Examiner is invited to contact the Applicant's undersigned representative at the address and phone number indicated below.

Respectfully submitted,

Stanley P. Fisher
Registration Number 24,344

Juan Carlos A. Marquez
Registration Number 34,072

REED SMITH LLP
3110 Fairview Park Drive
Suite 1400
Falls Church, Virginia 22042
(703) 641-4200

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